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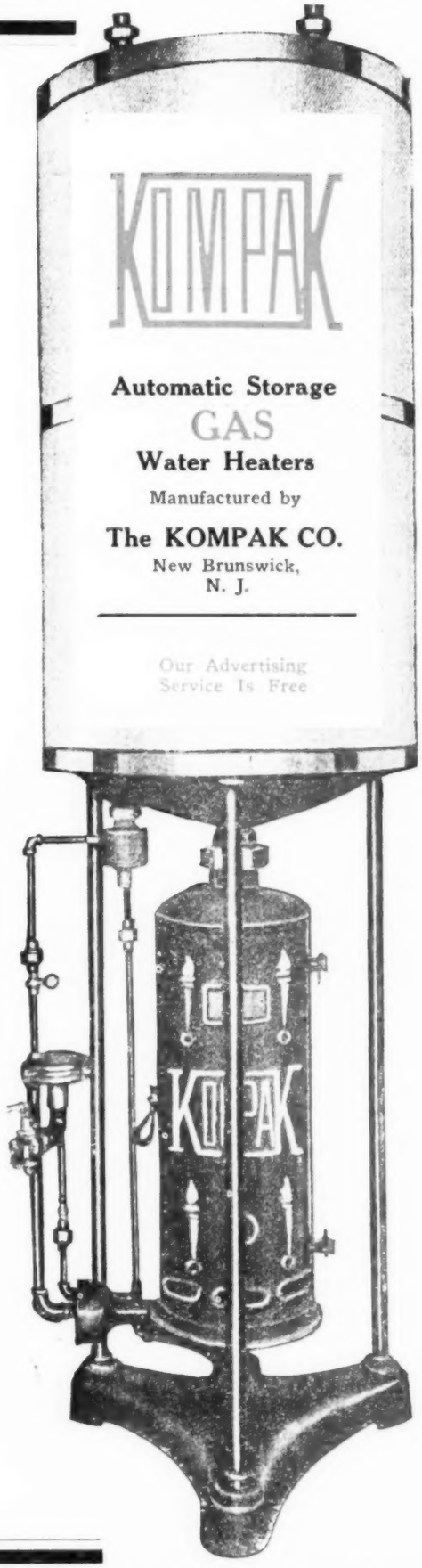

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"Free as Air"

Between the Smithy's Forge and the High-Powered Air Compressor There Runs a Scale of Power Cost That Is Most Interesting to the Industrial Gas Man

By H. M. CRAWFORD

The once common expression "Free as Air" has lost its usefulness. With the passing of the years we find the old expression further and further from the truth. Air, under certain conditions, has become a very expensive commodity. Industry requires quantities of air under pressure, but the power required to capture free air and compress it calls for the expenditure of considerable energy, increasing with the degree of compression. Air is used in heating operations due to the necessity for oxygen to support combustion, and free air containing this necessary element furnishes the simplest means of obtaining it. History tells us of the early efforts of humans to utilize fire, and in these primitive uses air was employed in its free state. Later we note that bellows and blow pipes were devised to increase the air supply and resulted in intensifying the flame. These devices were the first steps in air compression and were later to be improved and enlarged to suit the requirements of the huge furnaces of modern industry.

Perhaps the most familiar form of air compression is to be found in the shop of the "Village Blacksmith," where the great leather bellows, operated by the strong arm of the "Smithy," gathers free air and compresses it, driving the air into the hot coals of the forge to force the fire to a welding heat.

This use of air is termed "low pressure" and the scale of air application multiplies until we find a climax in the modern giant compressors weighing many tons and propelled by hundreds of horsepower. These enormous compressors supply air at high pressure to operate the great oil burning furnaces and to drive the riveting machines that build our great ocean steamships. Between these extremes of low pressure in the smithy's forge and the high-powered air compressors, there runs a scale of power cost which is most interesting to the industrial gas man. Many shops, shipyards and factories are equipped with single or two-stage air compressors, delivering air at ninety to one hundred pounds pressure. The air compressor is used for power distribution to all parts of the shops. Pipe lines carry this flexible power to the oil furnaces, to the air hammers, riveters and drills. The general use of high-pressure air is common practice in nearly all large works, and its application to air apparatus for which it is strictly suitable furnishes an economical and convenient power source. Workmen, by the turn of a valve on an air lift, can pick up weights that would require the combined efforts of a dozen men. The touch of a valve on an air hammer will drive a rivet in a few seconds where formerly hand sledges were employed with great effort and less effective results. High-pressure air is power in the hands of the modern workman. He uses it to atomize oil for his furnaces and rivet heaters, and its use has become so commonplace that no thought is given to the origin of this great force, and it is frequently applied when it is unsuitable, simply because of its availability.

Not Much Incentive to Economy in Use

"Air" to most laborers is simply "air" and all know that there is no limit or scarcity of that commodity. From the central compressor plant in the shops, air distributing lines radiate in all directions, there is usually no means of measuring the amount of air used by different equipment in the plant. When there is no means of checking the amount of air used by a workman on an oil-fired forge, certainly very little incentive is provided for him to economize in its use. Even if the average workman or foreman fully appreciated the power required to compress the air, which he uses with so little concern, why should he save it carefully when others in distant parts of the plant throw it away recklessly. The compressor doesn't know the difference, it works along just the same regardless of saving or waste. The fact that the power used at the compressor is proportional to the air delivered doesn't concern the workman, or even the foreman of any division. If the power bill is large for any one period why should *he* be concerned? It was probably someone else who used more air, nobody knows who, so why worry? It is this contempt, bred by familiarity, that causes the air waste in shops.

Proving the Point

The industrial gas man who endeavors to talk gas for shop furnaces is vitally interested in these things. He looks at a number of oil rivet heaters operating in the shop, no workman there knows how much air he is using and tests have shown that in consequence he is nearly always using too much, *with negative results*, for he forces his fires, oxidizes and burns his rivets. On a large number of shipyard rivet heaters, meters were

installed on air lines temporarily to prove this point. While the workman did not know that measurements were being made, the air per rivet forge registered 60 ft. per minute. Next day when all were told to be ready for a test the air used dropped miraculously to 30, and the average under all conditions was 40 ft.

Compressed air is money; its use offers an opportunity for one of the biggest leaks in plant expense when used indiscriminately. How does this situation concern the industrial gas salesman? Oil requires more air for combustion than city gas and it follows that the substitution of gas furnaces would result in a saving in high-pressure air.

To apply high-pressure air to small gas furnaces an air reduction valve is sometimes used, reducing the air pressure from 90 lbs. to 2 lbs., or to figures approximating that ratio. While a small saving in air can be shown in this way, the industrial gas salesman is not accomplishing his object unless he goes a step further, i.e., the elimination of high-pressure air for furnaces. Compressing air to 100 lbs. and then dropping it to 2 lbs. before utilizing it might be likened to driving loaded freight trains up one side of a mountain and then down the other side instead of using the tunnel. Gas can be used successfully with only 2 lbs. air pressure and compression need only be employed to that extent.

Frequently after securing the sale of gas furnaces in shops where high pressure air is used, the foreman or someone else will insist on using their air in order to escape the small additional outlay required to purchase a rotary blower. "Why spend money for a blower when we have all the air we need right here?" is a common inquiry. The very question itself shouts aloud the theory that "air is free," the cost of the compression isn't even considered. In his ability to eliminate *even a portion* of the load on the compressor, the industrial gas man has an argument for the use of his fuel fully as affective as any other that he might employ.

Saving of high-pressure air is just as important in the "one-forge shop" as with the big mill using dozens of fires, but it is not always so apparent in the former. All cost cannot be escaped, of course. In any case the saving can only be the difference between the cost of high pressure air and the cost of producing low pressure air. Let us therefore see how these air costs compare in dollars and cents.

The following tables show *horsepower required* for compressing 1 cu. ft. of free air per minute adiabatically from atmospheric pressure to various gauge pressures. Two-stage compression. Initial air 60 deg. Fahr.:

(*From tables of Ingersoll-Rand Company.*)

Gauge Pressure	Hp. Theoretical	Hp. Plus 15 Per Cent Rriction	Percentage of Saving Over One-Stage Compression
50	0.160	0.123	10.9
60	0.118	0.136	11.3
70	0.128	0.147	12.3
80	0.137	0.158	12.8
90	0.145	0.167	14.2
100	0.153	0.176	15.0
110	0.161	0.185	15.2
120	0.168	0.193	15.6
130	0.174	0.200	16.3

Two-Stage Compression—Air to 90 lb. Gauge

Horsepower required plus 15 per cent friction 0.167
Free air 40 ft. per forge 40

6.68

6.68×8 hrs. = 53.4 hp. at pulley.
Assuming motor and belt efficiency 80 per cent

$$\frac{53.4}{80} = 66.7 \text{ hp.}$$

then converting horsepower into kilowatt hours

$$\frac{66.7}{1.34} = 49.8 \text{ kw. hrs.}$$

Air cost is therefore:
49.8 kw. hrs. at 1 cent for large power users $0.50
or 49.8 kw. hrs. at 3 cents for average power users 1.49

These costs represent only the theoretical cost of compressing air for one forge during *one day's work*. Practical operating costs would be higher. Interest and depreciation on expensive air compressors, fuel oil expense, burnt and oxidized material and other items would be added to get the total cost, but we are considering one item only, *air*.

Assume that a shipyard was using 100 oil rivet heaters, atomizing with air. If they get electricity as cheap as 1 cent a kilowatt their *power bill alone* for 100 furnaces would be at least $50 per day, and probably much more.

If gas were substituted in this mythical yard, using Selas Gas Machines, the mixture would be supplied at about 1½ lbs. pressure with air and gas at a ratio of 1½ to 1. The total primary mixture to each forge would not exceed 550 cu. ft. per hour or 4,400 per day furnace. One hundred furnaces would require 440,000 cu. ft. of mixture per day and this could be accomplished with two type "Y" Selas machines using 15 hp. The energy therefore would be a total of 120 hp. or 90 kw. hrs. per day, which, at the same rate of 1 cent per kw. makes a total cost of 90 cents per day.

Cost of Air Alone in Oil Furnace Operation

It is, therefore, clear that high pressure air as used ordinarily with oil furnaces would cost in this case $49.10 per day more than low pressure air with gas. Bear in mind that we are considering only one cost of operation, air. It is decidedly favorable to gas. The Selas machine is cited as an example on account of the opportunity we have had to observe its practical operation in many shipyards. It is reasonable to assume that other premix types could be used with equal success.

Another type of apparatus which produces air at low cost is the fan blower, which used in connection with premix devices or to supply air for combustion, also shows great economy. Where it is possible to employ a blower for each furnace, the fan type offers exceptional advantages. The power is at all times in proportion to the load, resulting in low power cost for air and offers in addition the feature of single valve control.

An interesting comparison is made by the Eclipse Fuel

(*Continued on page* 150.)

Moving Pictures as an Educational Factor in Building Good-will

Cost Idea a Delusion—Picture May Be Produced at Cost Not Exceeding That of Printed Advertisement

By LEON LEE, President—Lee Service, Inc.

That the public must be shown and convinced that a gas company's problems are its problems, and that aid must be given if calamity is not to come to a territory, is conceded probably by every progressive utility operator to-day. But always it has been a question as to the best method to use, and whether, after all, there was any sure way of telling if the story had been driven home in a forceful manner.

One of the questions that have always held back a gas company, I am told, has been the item of expense, for no public utility company to-day is in a position to expend money unless it is sure of securing returns that will justify its use. It is this last, probably, that has delayed the entrance of the motion picture into the gas field until now, but that companies are turning to it as a means of spreading its story broadcast has been shown in my experience in the field.

The Cost Element

Let us therefore dispose of the first argument that arises in the mind of gas company officials—that of cost. Motion pictures, despite the dream of enormous price that has been spread regarding them, can be produced in such a manner and in such a way that the cost to an individual company will be comparatively small; smaller, in fact, than the cost of an average advertisement in the newspapers, which every company must use from time to time.

Of course, it is possible to spend enormous amounts and to do things on a tremendous scale, but this is not necessary; in fact, if I may be permitted the liberty of saying so, it is foolhardy. Motion pictures can be used by the smallest as well as the largest gas and electric companies throughout the United States at a cost that is practically nil.

Now that the question of cost has been dealt with, let us turn to that of what results may be reasonably expected. Were I to state here that a new rate will be secured solely on the strength of the showing of a motion picture in a theater I would be telling what is not so, for the millennium has not yet arrived.

But motion pictures will educate the public as no other means can, and the impression created by the motion picture is a lasting one.

In making these statements I am not writing from hearsay but rather from what I know to be facts; they are the result of a study of the effect created on audiences by motion pictures with a purpose.

Recently it was my privilege to produce for one of the largest companies in the United States a picture which had for its object the educating of its consumers to the need for a higher rate.

We tried out a picture which was more or less technical in its nature, but we were disappointed in the results obtained. The audiences it was shown to sat through it, but somehow it failed to arouse them to any action. I made it my business to talk with people who were members of the audiences, and I quickly learned that what had seemed so interesting to me and to the representatives of the gas company failed to interest the audiences. In fact, it was with a distinct effort that they centered their attention on it long enough to even remember that the picture had composed part of the program of the evening.

Need of Getting at Them from Lighter Side

It was after this experience that we determined to beard the movie fan in his or her den. We decided to put over the story in a manner that would strike home to them; in other words, to let them see that the well-being of their gas company was a matter of vital moment to them. And this was how we did it:

We prepared and carefully produced a one-reel comedy of everyday life, all the action centering about the shutting off of a gas supply. All of the problems of the cold meals, the cold home (and in this particular case the dark, unlighted streets) and of the unhappiness that naturally resulted were portrayed for the audience; always, however, with a vein of comedy spread through. Then we presented it to the audience.

No star of the theatrical stage awaited the performance of the first night with greater nervousness than did the officials of that company and those associated with me. When the picture was flashed on the screen there was nothing to show that it was propaganda for a company; on the contrary, it was a real motion picture film that had simply been localized to that company because it would have that much greater appeal. And the audience entered into the spirit of the occasion! At the conclusion of the reel there was a scattering of applause which quickly became general. The lover of the motion picture had been pleased.

Now as to the results that were obtained, and which perhaps, after all, are of greatest interest to the readers of the American Gas Engineering Journal. There was an audible hum of voices when the applause had died down. The comment was of a double nature. First, the local motion picture house was complimented for its progressiveness in persuading the local gas company to allow the use of its name; and, second and greater was the fact that the people discussed with each other the possibility of a real calamity happening so far as they were concerned.

That the impression thus created was lasting was shown by the fact that the gas company the next day reported that among those who visited its offices were several who were anxious to learn whether such a happening really could take place; whether the gas supply on which their families had been able to depend for generations would, or even could, actually stop. It was the greatest tribute that possibly could be paid to the value of motion pictures as a means of spreading education. Could anything have been more definite or concrete in its results?

The best part of the picture was in the fact that it was shown time after time at the same theaters and that it reached practically every consumer within a given radius of the theaters. Thus by moving it about from one theater to another, or showing it in two or more theaters simultaneously, all of the customers of the company were reached. Not only that, but those who had seen it once and had gone away not visibly impressed had it brought home to them much more strongly when it was shown at their next visit to the theater. And it is a fact that a certain part of that audience had not seen the picture before and were impressed.

This is one of the biggest advantages that a motion picture has over any other form of reaching the public, for it never varies and it reaches the consumer at a time when the public utility operator is ready for it to reach him, and company officials are sure that it will not be butchered and cut to pieces as so frequently happens with news articles that are furnished to a daily paper and which finally reach the public in the form that the reporter who wrote the story or the editor who passed the story thinks it should be told.

Then, again, there is a something about reaching a patron when he or she is in a receptive mood. The consumer has visited the theater to be entertained, has plenty of time on his or her hands, and is willing to be educated or made to laugh—anything, so long as the time is passed pleasantly for him. Perhaps the greatest example of the value of reaching the public at the theater was shown by the United States Government during the various Liberty Loan campaigns and kindred drives; only, in this case the performance was interrupted by a speaker who, brimful of enthusiasm, literally drew money out of the pockets of his hearers in great handfuls. How much greater is it, then, if instead of stopping a performance your story is made part of that performance, and while the patron of your company is being amused he is also being educated up to the point that the prosperity and well-being of his family depend in a tremendous measure on the success, prosperity and well-being of his gas company or other public utility.

One of the questions that I encountered when I first approached the gas industry was as to the desirability of reaching the audiences of a motion picture theater. The question which was most frequently asked was whether the thinking class attended the theaters and really gave any consideration to motion pictures? As to the question of who attends, I'll leave it to you as to how often during a month you or the members of your family attend the "movies." And, after all, Mr. Gas Man, you and the fellow members of your sex are not the ones we are really after. The man who said "The hand that rocks the cradle rules the world" knew whereof he spoke, for it is to the woman that you must make your appeal.

It's the woman who, at the dinner table, tries to take your mind off your business troubles by telling of something that has happened during the day, and she is the one who either commends or complains of the gas company. How many men entering your office preface their remarks with the statement, "My wife says"? Mighty near 100 per cent, I'm willing to wager. And this condition exists all over the world. Now, if you reach the woman and she tells her husband what she has seen at the movies, and if he applies his experiences of increased costs in his own business to the logic which has been brought home to his wife, I am willing to leave it to any fair-minded man how much opposition is going to develop when you make your application for an increased rate or a change from a candle-power standard to a B.t.u.

So that the case for the motion picture, it seems to me, is clear-cut and utterly unanswerable so far as the public utility company is concerned, for it has every advantage that can be desired plus the added feature of entertainment.

Furthermore, a motion picture reel if it is properly presented does not go before the consumer as something that is put out by the company as part of its propaganda and as such be passed over. Rather it makes its appeal to the risibilities of its audiences and incidentally spreads the word of the gas company. It has been the experience of every man who has ever put out advertising matter of any kind that a large proportion of the material he issues is wasted and that it falls short of its mark, no matter how carefully he schemes and plans for it to make its appeal to the consumer. Motion pictures, however, reach everyone who visits a theater; and who, offhand, can you think of that is better known than Mary Pickford, or Douglas Fairbanks, or Charlie Chaplin, or Larry Semon? Ask the owner of the nearest motion picture house to you the number of people who visit his theater weekly. I think it will amaze you, for I have no hesitancy in saying that it is greater than the circulation of the daily newspapers in the territory you serve. And remember, please, that these people are the ones you want to get at. You are not affected except in a very indirect way by what happens in the town next to yours, and part of the strength of the industry as a whole is secured by the well-being of your company.

The Internal Combustion Engine

The internal combustion engine was a great boon to the owners of small works in the British Empire, where power was employed when it was first introduced in the form of the Otto gas engine. Before its introduction anyone who wanted power was obliged to have a small steam engine, and someone had to be at the works very early in the morning to get the furnace going and steam up. If the boilerman was late, or if he had any difficulty with the boilers, the works were held up, so far as the machinery making power was concerned, until he got things in order. In those days works always started at 6 a. m., and so the boilerman had to be on the ground about 5 a. m., sometimes earlier on a Monday morning; and on cold winter mornings it was not surprising that occasionally he was behind time.

The relief to small manufacturers using these small steam plants when the gas engine was introduced was very great. Instead of having to get up steam, to light fires, etc., all that was necessary was to turn on the gas and give a few turns to the flywheel, and the whole works were under way. There were troubles, a good many of them, with gas engines in those early days. Ignition of the explosive mixture in the cylinder was obtained by the aid of a gas flame that was exposed to the compressed mixture of gas and air at the commencement of the firing stroke. The gas flame required very careful regulating, and often it would take fits of its own and would refuse to ignite the explosive mixture. Gas engines and all internal combustion engines have moved a long way since those days. It is now a most unusual thing for an internal combustion engine to do more than occasionally "backfire," as it is usually termed; prefire it is really—that is, fire before the proper time. Most well-arranged internal combustion engines run very continuously with very rare misses of ignition of the explosive charge. On the other hand, it should be noted, *en passant*, that when testing an internal combustion engine for the power it is delivering it is not safe to rely upon an indicator diagram, for the diagram takes no account of misfires, and they may occur, occasionally do occur, even in very well-made engines.

The gas engine was followed, not a great many years after, by the oil engine, in which paraffine was employed, the oil being converted into vapor, mixed with the air, compressed and fired, just as with the gas engine. The oil engine was also a great boon, as it enabled small factories and others requiring power in country districts where there was no gas, or where the gas was very bad and very expensive, to obtain power at a comparatively small cost.

Since then the internal combustion engine has marched along, as our Gallic neighbors would say, fairly rapidly; the gas engine has been steadily improved in its working and in the sizes that are available for power. In the very early days referred to above the largest gas engine made was listed as nominally 40 hp.; it worked up to about 60 hp. It was the practice in those days to list engines either by nominal horsepower or indicated horsepower. Both methods have given way to the modern system of listing engines of all kinds as furnishing so many brake horsepower. The nominal horsepower was an arbitrary figure, based upon some calculations made by the designers of the engines; they gave certain dimensions for certain horsepower and multiples of those dimensions for certain other horsepower. The arrangement led to considerable confusion; it was adopted not only by gas engine builders but also by steam engine builders, and a buyer never knew exactly what he was buying from a maker's list unless he also had all the dimensions of the engine. One firm of engine builders would be very much more liberal in the dimensions for a given horsepower than another firm; necessarily, their prices were higher and few buyers knew that in many cases the higher priced engine was really the better value when all the figures were known.

Listing by indicated horsepower was also very unsatisfactory; it meant the horsepower calculated from the indicator diagram. In the case of the steam engine the diagram gave very full information as to the work the engine was doing; but it was the work in the cylinder, the power the piston was obtaining in its to-and-fro motion from the expanding steam. It took no account of the friction of the engine itself, which was often considerable. The to-and-fro motion of the piston in the cylinder set up friction between it and the cylinder walls, and the friction absorbed some of the power the piston was furnishing. The piston rod, connecting rod, crankshaft and valve rods all created friction during their motion, and all absorbed power which was taken from that furnished by the piston, and so a considerable deduction had to be made from the indicated horsepower shown by the diagrams in order to know the actual horsepower that was available for outside work, for driving shafting and machinery. In those days it was usual to allow 10 per cent from the indicated horsepower in estimating the actual horsepower that was available. In many cases, however, especially with small engines, 15 per cent was absorbed by the friction of the moving parts of the engine, while in a few cases as little as 5 per cent was taken.

It was the advent of the gas engine that led to engines being listed in brake horsepower, because of the matter mentioned above the possibility, a very real one in the early days, of explosions being missed. It will be remembered that the indicated horsepower that any engine cylinder will furnish depends upon the area of the piston, the mean pressure behind the piston, less the mean pressure in front of it, where there was any; and upon the length of the stroke and the number of strokes per minute gave quite correct results, because every stroke is a power stroke. But with the gas engine there is only one power stroke, one useful stroke in two or four. This difficulty is, of course, easily overcome by allowing only the power strokes in working out the formula for the horsepower, provided that every second or fourth stroke is a power stroke. But if some of the power strokes are missed, if explosions are missed with some of the strokes, or if they take place before or after the proper time, these explosion strokes do not count, and there is no means of knowing exactly the number of proper explosion strokes except by watching the exhaust and counting them for a considerable time.

It is much simpler, though not always an easy matter, to measure the actual amount of power that can be obtained from the crankshaft when running at the proper speed of the engine. The method employed for measuring the horsepower obtainable from the crankshaft requires the use of some apparatus that will absorb all the power the crankshaft is capable of furnishing under any given conditions. There are now several apparatus on the market that have been specially worked out for absorbing the power from a crankshaft; but in the early days referred to the only method available was by the aid of what is called the "Prony" brake. It was a specially arranged brake, built something on the lines of those that are employed for the wheels of motor-car engines; two semi-circular disks of wood were made to clasp a pulley fixed on the crankshaft, and pressure was applied to the half-circles of wood by weights attached to a lever forming part of the brake and fixed on the upper half-circle of wood. When a test was to be made the engine was run at its proper speed and the power, whether steam, gas, oil or water, was allowed to flow through the engine or,

in the case of a water turbine, through the turbine; the crankshaft was made to revolve and give out power, which was absorbed by the friction between the two half-circles of wood and the pulley on the crankshaft. A simple calculation, from the number of revolutions of the crankshaft and the weight in the scale pan attached to the lever, gave the number of foot pounds of work the engine was furnishing per minute; and this figure divided by 33,000, the number in a horsepower minute, gave the brake horsepower. The test, which is even employed today, is a difficult one to make, but in skilled hands it gives very reliable results and it shows the actual amount of power available for work that the engine will deliver from its crankshaft. The same thing applies to a steam turbine running at moderate speed, but for very high speeds special appliances have had to be worked out.

Gas engines, oil engines and sometimes steam engines are now listed as giving so many brake horsepower at a certain speed with gas of a certain calorific value or oil also of a certain calorific value.

The principal apparatus on the market that have displaced the Prony brake are the air brake and the water brake. The air brake is a fan of a certain construction that has been designed to absorb a certain definite amount of power when running in air in certain definite conditions. The water brake is a somewhat similar arrangement: an impeller—an apparatus constructed something like a fan, but designed to work in water—is made to revolve in water in certain conditions, and the power required to run it at certain definite speeds is known from a careful series of measurements that have been made upon the apparatus. Both the air brake and the water brake require skill in use and care in arranging, so that the air and water conditions are those for which the brake is constructed. In skilled hands they give very good results, and where the exact air and water conditions cannot be arranged corrections can be made giving the brake horsepower with sufficient accuracy.

The power available from gas engines and from Diesel engines (a variation of the oil engine) runs into fairly high figures now. Tramp steamers are being built more and more to be worked by oil power, furnished by Diesel engines, and there is a report that an ocean liner has been constructed to work with them. Large numbers of gas engines and engines working with petrol and paraffine, and other engines working with what is now called fuel oil, are on the market and are in use in almost every industry, the powers taken from them ranging up to several hundred horsepower in a large number of cases. The gas or oil engine furnishing hundreds of horsepower is now quite a common object on the market.

During the last twenty years cheap gaseous fuel has come upon the market in the form of what used to be the waste gas from coke ovens and blast furnaces. Many can remember how the countryside in the neighborhood of an ironworks was lighted up by the burning gas coming away from the mouth of the furnace, and a similar sight might be seen in several districts, in the neighborhood of collieries where coke was made, due to the gas that was burning at the mouth of the beehive ovens that were in use. In modern ironworks the gas that used to be burnt so freely at the furnace mouth is now piped down to the ground and is used to heat the air with which the furnace is fed. It will be remembered that the blast furnace takes its name from the fact that a "blast" of air is being continually pumped into the bottom of the furnace by powerful engines. It is one form of mechanical draft. The use of the heat from the gases that used to be wasted in this way has led to considerable economy in the quantity of coke required for this purpose, usually not more than half, and the remainder is now being made available for power. The gas requires a considerable amount of cleaning before it can be used in the engine cylinder and the cost of cleaning is often fairly considerable. It is often a very troublesome process. Notwithstanding that, however, power obtained by the use of blast furnace gas should be almost the cheapest that is possible. Blast furnace gas has a very low calorific value, but that only means that a larger quantity is required to produce a given amount of power. The calorific value of ordinary town's gas before the war was rarely as low as 600 B.t.u. per cubic foot, and even now it can be fairly relied upon to give 500 units. Blast furnace gas has only a calorific value of from 80 to 100 B.t.u. per cubic foot, but by using more of the poorer gas the same power is obtained. A larger engine is required with low calorific value of gas, but the increased size is not considerable.

The modern coke oven is also run on quite different lines to those that used to light up the countryside. Special ovens have been designed in which only a portion of the gas that used to burn away freely at the mouth of the oven is now used to heat up the oven, the remainder of the gas, generally one-half, being available for lighting or power. Coke oven gas has a much higher calorific value than blast furnace gas; it is hardly ever less than 400 B.t.u. per cubic foot and is often as high as 500. The process of making coke is nearly the same as that of making town's gas; the difference is really in the product that is sought for. In town's gasworks coal is heated to a very high temperature in closed vessels called retorts, all the available gas is driven off, and a certain quantity of very hard coke, nearly pure carbon, is left behind in the retorts. In coke ovens the object sought for is a special kind of coke that is used in the blast furnace; the coal is heated in closed chambers, and the gas is again given off, but the coke remaining is not like gas coke, though the gas coming from the coke oven is very nearly similar to that made in town's gasworks. Coke oven gas has to be cleaned just as town's gas has, and valuable products are obtained from the waste materials obtained in the cleaning process. In a good many towns' gasworks "by-products" are also obtained. In both cases the value of the by-products is very considerable; and in the case of coke oven gas the value of the coke, and of the by-products, should enable the gas to be sold at a low figure. It is piped into some towns on the northeast coast of England and elsewhere.

Special Coal and Food Commission Appointed in Indiana

Law Passed by Special Session of the General Assembly—Gas Utility Men See in it Solution of Their Coal Problems

Copies of the new Indiana coal and food regulative law just enacted by the special session of the General Assembly and now in full force in that State, have just become available for public distribution. The law is the most drastic with regard to State control of fuel that ever has been enacted and will affect each of the dozens of gas utilities within the State in a direct manner at once. Although the law's provisions will stop its operation next March, it is probable that if it tends to solve the harassing coal problems of the consumer in Indiana during the coming winter, the next regular session of the Legislature, meeting in January, 1921, will extend its provisions to a farther date.

Attorneys of unquestioned judgment already have passed on the constitutionality of the enactment and declare that it will continue to be in full force even though attacked bitterly, as is expected, in the courts. Some of the coal operators are saying that its rigid provisions merely will result in Indiana coal being sent outside the State, but Jesse E. Eschbach, State examiner of the State Board of Accounts, which organization is empowered to administer the law, says that the powers of the board will stop any such practices. Utility men throughout the State are awaiting the full fruition of the law with something like panic in their eagerness. Their coal problems have become so enormous that the regular avenues of relief, such as the Public Service Commission, with its rate-raising powers over the utilities, does not seem to hold the key to the situation any longer. Gas men and other utility men are expecting much of the new law. Mr. Eschbach expects an attack in Federal court on the measure, but intends to begin its enforcement at once. An early summary of the proposed law was published by THE JOURNAL some weeks weeks ago. At that time it was intended to create a new commission to administer the law. Herewith is presented the new act, as it now is in full force, under its emergency clause, in Indiana:

Section 1.—Be it enacted by the General Assembly of the State of Indiana, That there is hereby created a special coal and food commission, which shall consist of the members of the State Board of Accounts, and which shall possess the powers and perform the duties hereinafter provided for in this act. The members of the State Board of Accounts shall serve as members of the special coal and food commission, hereby created, without additional compensation, and until the thirty-first day of March, 1921, and no longer, at which time the special coal and food commission shall cease to exist unless continued by subsequent legislation.

Section 2.—Immediately upon the taking effect of this act, the commission shall organize by selecting such engineers, accountants, clerks, assistants and employees as in the judgment of said commission shall be necessary or proper in the performance of its duties. A majority of the commission shall constitute a quorum, but on the order of the commission any one member thereof may conduct any hearing or investigation, hear all evidence adduced at such hearing and report the same to the commission for its consideration and action. The commission shall fix the salaries and compensation of its employees, clerks, engineers, accountants and assistants, and shall have power to employ and retain attorneys to appear for and represent it in any action brought by or against said commission and to fix the compensation to be paid said attorneys.

Section 3.—Said commission shall prescribe rules and regulations for all hearings and investigations held before such commission and in order to carry out the terms and provisions of this act.

Section 4.—Any person, copartnership or corporation against whom any final order is made by said commission, being dissatisfied therewith, any such person, copartnership or corporation whose property is injuriously affected by any such final order of the commission fixing a rate, prices to be paid for coal, or valuation of any coal mining property may within ten (10) days from the entry of such final order commence an action in the Marion Circuit Court of Marion County, Indiana, against said commission as defendant to vacate and set aside any such order on the ground that the same is confiscatory, indefinite, unreasonable or unlawful, in which action the defendant shall be served with summons returnable five (5) days after the service thereof. Said cause shall be tried expeditiously and shall have precedence over all other business of such court. Nor shall the effect of such order be suspended nor the same vacated or set aside until the final determination of said cause by the court. If any such order shall be vacated, the commission shall have full power to make a new order, after notice and hearing.

Section 5.—Each of the commissioners and every agent and employee thereof, shall have power to administer oaths, certify to any official act, issue subpoenas, compel the attendance of witnesses and the production of books, accounts, papers, records, documents and testimony. And ever person, firm or corporation owning, operating, controlling or leasing any coal mine or coal mining property in the State of Indiana or engaged in the business of mining coal therein or engaged in the business of selling coal at wholesale or retail in the State of Indiana, and all officers, agents, servants and attorneys of such persons is and are hereby required, upon proper subpoena or order from the commission, to produce for the inspection of such commission all such books, records, accounts, papers and documents and to give evidence of any fact bearing upon the price of coal, the cost of its production or sale and any agreement or understanding to regulate or control such price. In case of the disobedience on the part of any person or persons on failure to comply with any such order or subpoena made or issued by any commissioner or by such commission or upon the refusal of any witness to testify with respect to any matter about which he may be interrogated before the commission, or any commissioner or any agent thereof, it shall be the duty of the circuit or superior court, or the judge thereof in vacation, in the county in which such person resides, upon the application of the commission or any commissioner to issue a rule against such person so refusing to show cause why he should not be required to testify or to comply with such order, and such court upon the return of such person to said order to show cause, shall make such order as is proper and enforce the same as other orders of such court are now enforced pursuant to law.

Section 7.—Immediately upon the passage of this act, every person, firm or corporation engaged in the busi-

ness of mining coal within the State of Indiana and every person engaged in the sale of coal at wholesale or retail within such State shall apply to and obtain from said commission a license annually to do such business for the succeeding year for which the commission shall charge for each mining license the sum of twenty-five dollars ($25.00), for each wholesale dealer's license the sum of ten dollars ($10.00) and for each retailer dealer's license the sum of five dollars ($5.00), all of which shall be paid into the treasury of the State of Indiana, and used for the purpose of paying the salaries and expenses of such commission. No such license shall be issued to any person, firm or corporation, which has violated any lawful order, rule or regulation of the commission or any member thereof, or which upon proper notice, has failed to obey any order of the commission or of any commissioner for the production of any book, paper, record, data or document or which has refused to give any evidence about which he may lawfully be interrogated on any matter which the commission or any member thereof was inquiring into. And any such license so issued may be revoked and annulled, after notice and upon a hearing before the full commission, for any cause which would justify the commission in refusing to issue such a license, subject, however, to the right of the person, firm or corporation whose license is revoked or annulled to commence an action in the Marion Circuit Court to set aside such order revoking or annulling his or its license subject to the same provisions as are fixed by Section four (4) hereof for commencing an action to set aside or vacate other orders made by the commission. Any person who operates a coal mine or produces coal in this State or sells the same at wholesale or retail herein without having obtained such license, or after his or its license has been revoked shall upon conviction, be fined in any sum not exceeding five thousand dollars ($5,000.00) to which may be added imprisonment in the State penal farm for a period not exceeding one year or both fined and imprisoned.

Section 8.—Said commission shall have the right and it shall be its duty, after full hearing, and after affording to all persons interested a full opportunity to be heard, to adduce evidence and to be represented by counsel, to regulate and fix the price at which all coal moving in intrastate commerce in the State of Indiana shall be sold, both to jobbers, wholesale and retail coal dealers and to the public, provided that no price so fixed shall be confiscatory, nor shall it be less than the actual cost of the coal plus a fair and reasonable return on the property used in the production and sale thereof. Said prices may be fixed either at so much per ton or on any other basis or scale which is fair, just and equitable, or the commission may prescribe maximum and minimum prices, if it sees fit to do so. If in its judgment, the production of coal in any particular vicinity or of any particular kind of coal can be fairly regulated as to price by one order, the commission shall have power so to fix a price, after notifying all parties in interest of the hearing.

Section 9.—It shall be the duty of the commission to determine, as soon as that can be done after its organization, the average monthly consumption of coal in Indiana for all purposes, and it shall have the power and it shall be the duty of the commission to require all persons, firms and corporations mining coal in Indiana to produce and sell or offer for sale in this State a sufficient quantity of coal to supply domestic demands and at such a price to be fixed by the commission, the individual operators to furnish such proportions and amounts thereof as such commission shall, by appropriate order, prescribe.

Section 10.—Nothing in this act shall be taken or construed as regulating the price of coal moving in interstate commerce, or as prohibiting the sale or transportation of coal in interstate commerce, but only as requiring the mining of a sufficient quantity of coal for domestic consumption, except for manufacturing purposes; the General Assembly recognizing that the coal deposits of this State are amply sufficient for decades to come to supply all legitimate demands of intra and inter state and foreign commerce, which will be made upon them. And any person, firm or corporation who shall refuse to comply with any such order shall have his or its license to mine coal revoked after notice and hearing, with the right to test the validity of such order by commencing and acting in the Marion County Court subject to the conditions prescribed in Section 4 of this act.

Section 13.—There is hereby imposed upon every ton of coal mined in this State after the taking effect of this act a license fee of one (1) cent to be paid by each person, firm or corporation engaged in mining coal; such sum shall be paid into the treasury of the State of Indiana monthly on the 10th day of each calendar month. On or before the date of such payment, each person liable to pay such tax shall file on a form to be prescribed by the Auditor of State a report showing the number of tons mined by him in the last preceding month. The money so paid shall be used in paying the expenses of said commission including salaries, compensation and expenses of the commissioners, agents, clerks, employees, special counsel and assistants, but if not sufficient for that purpose, there is hereby appropriated out of the treasury and out of the funds not otherwise appropriated a sum sufficient to pay all said expenses.

Section 15.—In fixing the cost of coal to the producer the commission or any court passing upon the question shall allow the cost of production, including all reasonable and proper expenses for operation, maintenance, depreciation and depletion and shall add thereto a just and reasonable profit. In fixing the prices for dealers the commission or court, as the case may be, shall allow the cost to the dealer, including transportation and reasonable distribution charges, and add thereto a just and reasonable sum for his profit in the transaction.

Section 16.—In the event that the Federal Government through any of its agencies shall take over the operation of any coal mine situated within the State of Indiana or of the production thereof or the means or facilities for producing such coal, then and in that event during the time such coal mine is taken over or its production requisitioned by the Federal Government, neither this act nor any of its terms and conditions shall be construed as authorizing the State of Indiana or said commission to control said mining property, its appurtenances or appliances, but the same shall be during such time subject only to the Federal control. If the Federal Government through any of its agencies shall take over any distributing instrumentality or shall make any order, rule or regulation, or enforce any practice affecting it in any way or any coal producer or distributor in this State, then for the time that such instrumentality is taken over, or such order, rule, regulation or practice is in force, this act shall not apply and the production, sale or distribution of such coal shall, to the extent the same

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As the Journal Views It

Drifting to the Other Side

Between the socialist and the capitalist there has long stood the middle class. Among wage-earners the socialist has had little difficulty in finding believers and disciples. But among the salaried folk he has met only with dogged, almost unreasoning antagonism.

Nowadays we are inclined to credit the socialist with a certain degree of reasoning power. To attain his individual advantage we concede he has demonstrated a sometimes surprising mental ingenuity. If our socialist ever reasoned at all he must in the past have gnashed his teeth on many occasions at the thought of that salaried middle class; for, no matter what headway he might make among the laboring class, he could not hope to reach and considerably damage the capitalist so long as the numerous and, in general, virile salaried middle class stood in the way.

It has been capital's best safeguard against socialism.

One is, therefore, particularly disturbed at the apparent change that has occurred in the manner of thinking of this salaried middle class.

It is quite common, almost the usual thing, of late to hear salaried workers, in all ways save in remedies, talking as the most rabid socialist would talk.

They seem thoroughly embittered with employers and employing corporations, distrustful of their motives and thoroughly cynical as to any good intent that may be ascribed to them.

The lot of the salaried worker has been a most trying one. His utterances are an indication that

his mental faculties by worry and eking along are rasped almost to the breaking point.

He is not the old-time, rather phlegmatic, cool-headed, easy-going type we had gotten accustomed to. Rather does he seem a smoldering element of discontent.

The situation of the salaried worker will bear looking into. Capital along certain lines—and any capitalist is at liberty to divert his funds to those lines—has prospered. Labor has done even better. The salaried worker and conservative investor, in so far as the cost of the present hectic period is not being paid by going into debt, are paying the bill.

The salaried worker may continue in the future, as he has been in the past, sound-headed and well-balanced, confidently awaiting the settling-down period to recoup his losses. But he is being fiercely prodded in the other direction. He may be strong-willed enough on his own part to refuse to be driven, but his effort alone surely entitles him to the encouragement of that side which is most indebted to him—namely, capital.

Getting Them in Their "Off" Moments

The idea of the moving picture as a means of gas company publicity is not new. But not much has been made of it.

Leon Lee, a practical moving picture man who has gotten a real insight into the gas business, supplies something concrete in his article which is published elsewhere in this issue.

On the order of one of the large gas companies he prepared a reel to combat an idea that has been zealously nurtured by gas companies and that in recent times has reacted injuriously against them: that of the certainty of gas supply.

People have been accustomed to a sure and certain gas supply all their lives. For some years now individual companies have been shouting from the housetops that they are on the verge of ruin; that it is but a question of a very short time, unless forestalled by relief in rates, until the plants must shut down.

But because man is so constituted that he will not sit by and see his principal toppled over from mere hesitancy to risk a few more dollars, gas companies have, by scraping in every dollar they could manage to get hold of, managed to struggle on.

This has but increased public indifference. Of course, it seems impossible for the gas companies to continue in business against the conditions it faces; no other industry with which the layman is more intimately connected could. But the fact remains, it is still there, generating gas much in the same old conscientious manner it always has. A cloak-and-suit business may fail, the gas supply never, is apparently the notion with which the average citizen bolsters up his "small concern to me; they'll struggle through somehow" attitude.

And it is public indifference more than public unfriendliness that is holding back rate relief and standards adjustments. Before we can accomplish much he must be jarred out of this apathy; brought decidedly to an understanding that the gas supply is a fixture regardless of conditions; that it's something that is bound to come just as the rising of the sun.

Too long delayed in coming to him, this understanding may come violently and disagreeably in the actual shutting off of the supply.

Such a contingency must be avoided, not only for the sake of the consumer but for the sake of the company.

Mr. Lee apparently believes that a picture of the actual as a skilled imagination may produce it can arouse the layman in time to forestall a real taste of the actual.

Since there is no greater aid in enabling one to visualize a thing than actually letting him see it, the AMERICAN GAS ENGINEERING JOURNAL is in sympathy with the thought.

Mr. Lee's article is well worth a careful reading.

"Free as Air"

(*Continued from page* 142.)

Engineering Company as to the power required to compress air by single stage adiabatic compression and power necessary to deliver a corresponding amount of air by the use of a fan blower. They refer to the booklet issued by Ingersoll-Rand Company, "Compressed Air," page 110, from which it is noted that 18 indicated horsepower is required to compress 100 cu. ft. per minute at sea level. "This would be at the rate of 6,000 ft. per hour. Comparing this with the Eclipse foot tables it will be noted that fan No. 4615 will deliver 36,000 ft. of air per hour with an expenditure of energy amounting to only 3 hp." In other words, to deliver 36,000 ft. of air per hour with single-stage compression, it would require six times 18 hp., or a total of 108 hp. For the same quantity of air, therefore, 108 hp. is required for high pressure as against 3 hp., for the fan blower, or 36 times the power requirement for the higher pressure. The cost, of course, is in proportion. The reason for this great difference in power required is due to the pressures employed. In one case air is compressed to 100 lbs. per square inch, and in the other to 20 in. of water column. The point is, that, as air can be successfully used with gas at the lower pressure and high pressure air is the rule with coke and oil, the saving of power which is possible through the use of gas and low-pressure air is a great argument in the hands of the industrial salesman.

When one stops to figure the cost of air where high pressure is employed, the results are startling. Are these conditions really found in practice? Yes, everywhere, but few of us have ever calculated *all* the items which favor gas installations. All industrial gas men know that our figures should always show *net results*. We figure interest on investment, depreciation, mainte-

nance, increased production and many other items depending upon the nature of the installation. Let us not forget the "cost of air." It is no longer "Free." The close calculation of air costs in addition to our usual figures may swing many a job into the gas fold. The industrial gas man will find few men among his customers who are familiar with their air costs—and few who think they are familiar will believe that high pressure air is so costly in furnace work. Nevertheless, these costs are correct and it is the salesman's job to pound these facts home. There is a small machine shop where a Stewart gas forge was installed to replace coal. To save a blower the forge was equipped with an air reduction valve attached to the shop single-stage compressor delivering 100 lbs. air pressure. The valve reduced the pressure to about 2½ lbs. at the forge. This installation was made contrary to the gas man's advice. The shop owner could not be convinced that his net costs would be higher with high-pressure air than with a blower. His operating costs with his small compressor and 3-cent power are as much for *air* as he is paying for *gas*. This he cannot see because he cannot measure it. His idea is to attach it to his compressor to save additional equipment cost. His knowledge does not permit him to investigate further, yet he is an excellent mechanic of average intelligence. He serves as an example to illustrate how the average shop man regards air costs. Many might say, "Well, why bother with him? as long as he uses gas anyway—it makes no difference to the gas man *what* his costs might be." But business nowadays is built upon *service*. The gas man's duty is to give his consumer the most possible for the dollar which is spent with him.

A policy whereby the gas company secures revenue for which the consumer has not received the greatest possible value is temporary business always. It cannot endure, because the first competition in the form of another method or another fuel will be successful and gas will be displaced. The salesman who permits his customers to use more gas than necessary to properly operate their business is seriously injuring his company. Such a shortsighted policy might be likened to a house of cards.

Give the customer *service*—first, last and all the time, and our business will build on a foundation so solid that it will require much to shake it. And further, we gas men must realize now that we will have need of all the rock bottom foundation that we can build upon. Our old competitor "electra" is making new encroachments upon our field. While we are building up our industrial gas load "Electra" is already beginning to tear it down. Cooking and water heating by electricity have made great headway. Our gas fired "reel" bakery ovens are already running a close race with electric ovens of the same type. The Government mints in at least one instance has replaced gas furnaces for melting metals with electric equipment, and even ship rivets are now actually being heated by electricity. A great many such instances can be cited and the cost of electric operation is very satisfactory considering the results obtained. Naturally this competition will be most keen where hydro-electric power is available. So we gas men cannot sit by with a smile of self satisfaction at our past achievements. We have done well to build up an industrial gas load—now we must fight to keep it and extend it. A business which stands still, really goes backward. We will have need for friends so let us see that they get all we can give them for their money.

Air, as we see it used to-day in industry, is not "free" and it will pay all of us, who are fighting for industrial gas business, to analyze it closely for our consumers. It will add one more argument for the use of gas—and we will need all the argument we can employ.

There is one shipyard on the Pacific Coast where more than 200 rivet heaters were operated with oil and high-pressure air. The cost in this yard showed $2.28 per day for the operation of each forge. Air was supplied in this plant from a central compressor station where the electric power bill approximated $10,000 per month. What part of this bill could be attributed to rivet forges, leaks, hammers, etc., the yard had no way of determining. Later, however, the yard substituted gas in all the forges, using premix low-pressure machines driven with 10 hp. motors. The average cost per heater dropped to $1.30 per day and the load on the compressor plant was reduced nearly 40 per cent. Several compressors were shut down entirely.

The adoption of gas resulted in a saving of electric power on the air compressor amounting to nearly $4,000 per month. Could any practical example serve better to illustrate the cost of high pressure air and the necessity of its close analysis by the industrial gas man? The time is at hand, at least in these instances, for the complete refutation of the adage "Free as air."

Special Coal and Food Commission Appointed in Indiana

(*Continued from page* 148.)

is affected thereby, be under the sole control of the Federal Government.

Section 17.—Whoever with knowledge that the prices of coal have been fixed, as herein provided, shall ask, demand, or receive a higher price therefor or with the knowledge shall refuse to conform to any valid order made by the commission shall be guilty of a misdemeanor and shall upon conviction be punished by a fine of not more than five thousand dollars ($5,000) or imprisonment in the State penal farm for not more than six (6) months or by both. Each independent transaction shall constitute a separate offense.

Section 18.—This act shall receive such a construction as will avoid any conflict with any Federal statute, or with any rule, regulation, practice or order lawfully adopted by any Governmental agency or officer charged with the duty of controlling or directing the sale or distribution of coal.

Section 19.—The commission shall have the right to hold joint hearings with any other State or Federal body, agency, officer, board or commission on any question or matter included within the provisions of this act, if such hearing can be arranged and is thought by the commission to be advantageous. And for the purpo of such hearings, the commissioners appointed travel at the expense of the State to and from the fixed therefor. And, if deemed advisable or tageous, said commission shall have the powe with any such other State or Federal body, cer, board or commission, any joint ord joint regulation, joint rate, or establish a or to make the same order, rule, regul tice by separate order. And such any hearing held by it, avail itsel data, records or accounts collec other State or Federal agency

Section 20.—Said commi

and power to fix, among various classes of users of coal in this State, the priority in which such classes shall be furnished coal, including railroads, public utilities and munition plants, industries and the people of this State, and, in case of a shortage of coal or transportation facilities, to determine which class or classes of users shall be first supplied and to what extent. In case of emergency, said commission may order and direct that coal be furnished to such users so designated by it from any mine or mining territory in this State, and fix the quantity so to be delivered. When said commission has made such determination, it shall certify same to the Public Service Commission which shall immediately take such steps with reference thereto and in order to accomplish the transportation thereof, as are now or may be hereafter authorized by law.

Section 21.—In no event shall any price for coal be fixed in excess of the price established therefor by the Federal Government or any of its agencies.

Section 22.—Said commission shall also investigate the high cost of food products and profiteering, hoarding and destroying of food products by wholesalers, retailers, dealers, and individuals engaged in the sale and distribution of food products and make recommendations to the Governor for the preparation of a bill to be presented to the consideration of the next General Assembly recommending such laws as will prevent said profiteering, hoarding and destroying of food and food products used for human consumption on the part of said wholesalers, retailers, dealers, individuals or distributors of such food or food products.

Section 23.—There being an emergency for the immediate taking effect of this act, the same shall be in full force and effect from and after its passage.

Should a Pulley Be Made of Wood, Paper, Cast Iron or Steel?

(Copyright, 1920, by W. F. Schaphorst.)

In a recent number of a prominent technical paper this statement was made: "Small high-speed pulleys having a metal face should be grooved, to give the belt a better grip on their surface. Remember this, too: Belts are less likely to slip on wood, paper or leather covered pulleys than on iron-face pulleys."

The writer has always been opposed to the grooving of pulleys in order to increase tractive effort, because cutting, grooving, roughening, etc., are invariably hard on the belt.

For the same reason I have been opposed to the use of coverings on pulleys of any kind, because I believe the hypothesis is wrong for numerous reasons.

It seems to be generally thought that a pulley covering will produce greater efficiency by increasing the frictional quality of the pulley face. It is also thought that grooving and roughening in general will accomplish this same purpose. However, any pulley covering that is in the slightest degree rougher than the polished metals raises the belt up on the highest point of the rough surface, thereby decreasing the area of contact between the belt surface and the pulley surface, and thereby increasing the tender[illegible] slip by a corresponding amount. The ter[illegible] peak load is thus toward a decrease ns[illegible] crease in transmitting capacity.

[illegible] emembered that no material with [illegible] ble to coat a pulley will absolutely prevent all slip at all times, or at any time, because belt creep cannot be eliminated. When slipping, therefore, does occur, a necessarily higher degree of heat is developed between the belt and the rough pulley face than is possible between the belt and a polished pulley face, with possibility of increased injury to the belt in consequence, while, on the other hand, absolute prevention of slip at all times may not be desirable.

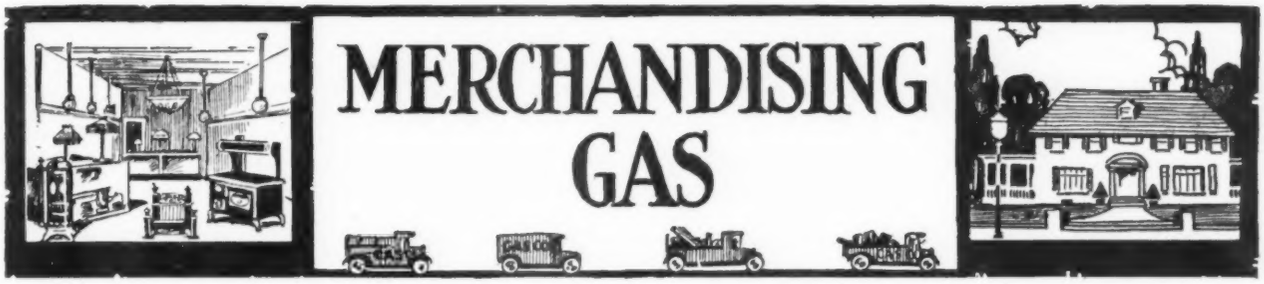
With a roughened surface, it is obvious that as the belt creeps (which is simply another form of slip) the wear on the belt is found to be greater than it would be on a polished surface.

Again, under sudden starting a heavy load will cause momentary slipping. It is then essential to permit the belt to assume its load gradually. For example, if a street-car motorman tries to get his car up to full speed from rest by throwing the controller through all notches at once, the passengers and mechanism would get a severe jolt and the motor, if unprotected by a fuse, would burn out. Similarly, a slight momentary belt slip performs the same safety function as the fuse, and does so automatically to prevent sudden destructive strain. Granting, then, that a pulley covering could prevent slip completely under extreme conditions, there would be nothing gained.

Pulley coverings rarely retain the uniformity of face which they have at the start, and the growing irregularity continues to decrease belt contact and belt efficiency. As the glue or cement with which the covering is held dries out, becomes brittle and cracks, the intimate pulley contact is distributed and slippage is aggravated. Furthermore, the dependence on pulley coverings alone for increasing belt efficiency does nothing to preserve the belt fabric and keep it pliable. Efforts to produce perfect belt efficiency through manipulation of the pulley face do not offer the proper solution, and tend to aggravate rather than stop the trouble.

As for which pulley is best—wood, paper, cast iron or steel—the writer has had experience with all kinds of pulleys, but in practice has been unable to detect an all-around superiority in any make. They are all good provided they are smooth on the pulling face, as they should be. The proper thing to do is to treat the belt so that it will properly wrap around the pulleys in intimate contact. There will then be no slip, no matter what the make of the pulley. There will be creep, of course; because creep, due to the elasticity of all belts, cannot be avoided. Even the steel belt is elastic; and hence the steel belt slips, although the slip is not so great as in the leather belt.

Also it might be well to point out that manufacturers of wood pulleys claim the wood pulleys to give the highest tractive force and the least slip. Manufacturers of paper pulleys come out with facts and figures concerning the non-slip of belts on paper pulleys. Manufacturers of cast-iron pulleys can prove with actual figures, curves, data, etc., that there is nothing better than a cast-iron pulley. And, of course, the manufacturers of the steel pulley can prove that the steel pulley is head and shoulders above them all. As stated before, it has been my experience that they are all good and they should all be used, depending upon conditions.



Peterson Philosophizes on Service

By S. G. Addison

The other day I dropped off between trains at Blankville and made a call on my old friend Peterson. He always has some bug in his bonnet and I like to talk with him for that reason if for no other. Many times I get good ideas from him. I had no more than reached his office, said good morning, given him a cigar and got my own going good when Peterson started.

"What do you think of this word 'service'?" he asked me.

"Well," I said, "the way that most of the business men whom I know use it, I should say that it was an excuse for paying out money for which no returns can be expected. Back in the old days they used to charge the same items to selling expense; later they charged them to advertising, but now they call it service. It's the same thing in many ways that you call miscellaneous in in your personal cash account. It may be money that you have spent that you don't want your wife to know about and it may be items you have forgotten or that you don't know just how to class."

That started Peterson off for fair. I thought that it would. Something like that generally does.

"You are wrong," he said. "Some day service will be recognized for what it is worth just the same as salesmanship and advertising have come to be recognized for what they are worth. I'll tell you what service is. It is merely making it easier for people to spend more money with you. All people seem to be lazy by nature. Even when they spend their money they spend it where it is easiest to spend it. Take the packaged goods that we are all buying to-day. Why are we buying them? We are not buying them because they are cheaper. I don't believe that many people are buying them because they believe they are better. They are just buying them because it is easier to buy packaged goods than it is to buy bulk goods. It is easier to say give me a package of crackers than it is to say give me a half a pound or a pound of crackers. It is easier to carry home a package as it is made up by manufacturers to-day than it is to carry the same goods home in a paper bag as our grandparents did. This doing up goods in packages is merely service. It makes it easier for us to spend our money. When added to this, the goods are nationally advertised and each food is called by a different, short, easily pronounced trade name spending our money becomes even easier. We don't have to describe what we want. We merely say give me a package of so-and-so.

"Take a case that happened here recently in the public utility business. The electric light company has been in the habit, not only of supplying lamps free to their customers, but also of making periodical inspections and seeing that the sockets are all equipped with good lamps. In this service they naturally used lamps that would result both in satisfactory light to the customer and a satisfactory revenue to the company. As the cost of doing business continued to increase, it became more and more necessary to economize and as a step towards economy this service was discontinued. What was the result?

"The lighting revenue has continued to fall off since this service was stopped. It has fallen off for two reasons. For one, consumers are not so careful to see to it that there is a serviceable light in each socket. For another, many of them are buying and using smaller lamps than they did when the electric company was giving this lamp service. You see it has become a little harder for these consumers to spend their money, so they are not spending so much of it with the electric light company as they did. They are spending it in other ways that are not so hard. In the old days when all that was necessary was to press a button or turn a switch in order to spend money for electricity people were spending all that they could afford to spend for this purpose. Now when they have to put forth a little more effort, they are not spending so much."

I was afraid that Peterson was going to wander a long way from the gas business, so I suggested, "But I should think that you would be glad of that. It leaves just so much more money for the gas company."

"I am not so sure of that," he came back. "I have an idea that the more service there is rendered by any class of business, the more money people are going to spend with that class of business. The electric light and the gas business are both public utilities. If people get out of the habit of spending money with the electric company, it is only another step to include the gas company. As a matter of fact, the business of the two companies is rather closely related, anyhow.

"People have just so much money to spend. They are going to spend it where it is easiest to spend it. By this, I do not mean that they do not want full value for that which they spend. What I do mean is that they are going to spend their money where good values considered it is made easiest for them to trade.

"The reason why we have never done more than we have in the gas business is because we have not given enough thought to this subject of making it easy for people to spend their money with us. We have done something along the line of selling appliances, but even here we have not gone to the limit that we should.

I know of an electric lighting company that is wiring a lot of old houses and does no wiring at all itself. Any house owner can select any contractor in town he desires and then make a contract through the electric light company to have this contractor do the wiring. He pays for the work in equal instalments covering a period of twenty-four months. It is so easy to have electricity put into the house under this plan that many people are putting it in, instead of gas or are cutting out their gas lighting and installing electricity. You see this is a form of service that makes it easy for these people to spend their money. It is service, too, and not cutthroat competition. The work is all done by contractors so the contractors are boosting for the company. It is real service. It makes it easier for the contractor to make money and for the people to spend it. We could do a lot more work along this line than we are in the gas business. Some gas companies are doing it. We are getting ready to do it here.

"It is not in selling appliances, however, that we, in the gas business, are most interested. What is of real interest to us is the amount of gas that is consumed in those appliances after they are sold. Personally, I believe that it would be better for all of us, if we did not sell another appliance. There are, to-day, a lot of retail dealers and a lot of plumbers who would gladly take off our hands all the troubles connected with house piping and appliance sales and installations, if we made it clear to them that we were really going out of the appliance and house-piping business for good.

"The sort of service that we must render is making it easy for people to burn gas in the appliances that they have. This winter and next spring I am not going to be satisfied with selling room heaters. I am going to work just as hard to get the room heaters that are already in homes into operation. Do you realize how many people are not using the heaters this winter that they bought last winter for the reason that the hose has given out? All that is necessary to get these people to use those heaters this winter is to get the heater out of the cellar or the attic and connect it up with a hose. If the heater is not in good shape a little repairing may possibly put it into good shape.

"I am sending out notices to all of our customers in regard to the heaters that they already have. We are offering to deliver to them a hose at a price no higher than they would have to pay if they came to the office. We are offering to inspect the heater and suggest any repairs that may be needed and what they will cost. We are offering to re-black the heater free of charge and burn it off in our own shop so that it will not fill the house with smoke the first few hours it is used. To make it as easy as possible for people to notify us, we have enclosed in each letter a stamped and addressed post card. Even the name of the consumer and his address is filled in. All that the consumer has to do is to check the thing that he wants done. This is so easy that we are getting surprising returns from these cards and it looks now as though it is going to increase gas consumption materially."

"But how about your gas lighting?" I ventured. "It seems to me that this is the time when the gas company should be interested in gas lighting."

"We are giving all the service that we can in the case of gas lighting. Unfortunately we have not, as is the case with the electric lighting company, a lighting rate that takes care of service as well as gas. We are extending our free inspection service as far as possible. I am now preparing data to present to the public and to the Public Service Commission in the hope that we will be granted an additional rate for strictly gas lighting service. If we can get that, we will be able to give both free inspection and free mantles and glassware to all those customers who are using light and nothing but light on their meters. If we are able to get this thing through, it is going to make a big increase in the amount of gas we sell for gas lighting, for the service that we will render will make it easier for them to spend their money. You see that, after all, service is nothing more or less than making it easy for the customer to spend his money with you. The sooner that business men come to realize this the better it will be, both for business, and for the buying public."

Dallas Gas Light Co. Files New Rate Schedule for Commercial Users

Placing the burden of the increase solely upon the commercial consumers, under the assumption that they can carry it more equitably, the Dallas Power & Light Company, Dallas, Tex., has filed an application with the City Commission for a new schedule of rates which is estimated will net them an increase in revenue of 12½ per cent.

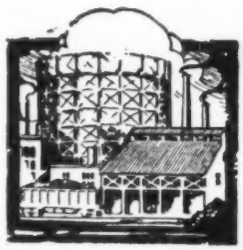
The request for the increase, which does not affect the rates for residence lighting, is based on the increased costs of labor and material since the present rates were put into effect. As an example it is cited in the request that fuel oil has increased in price 367 per cent over normal conditions prevailing in 1917. Part of the fuel oil used at present is bought for 97½ cents a barrel, the present market price. It is also stated that materials have increased approximately 50 per cent, while the cost of labor has increased the same amount.

Taking the month of June, 1920, as a basis, the proposed rates would have increased the revenue for that month from $174,752.91 to $201,985.75, an increase of about 15 per cent. It is estimated, however, that the consumption of current will decrease at least 10 per cent from conservation adopted by the consumers due to the increased cost under the proposed rates, which would make the increase in revenue to the company only $25,406.62 for the month, or 12½ per cent to the company.

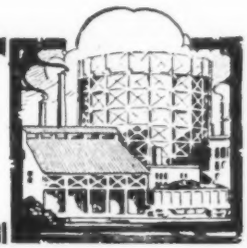
The stand of the company is voiced in the letter of transmittal received with the new schedule. Charles W. Davis, vice-president and general manager of the company, who signed the letter, said:

"We, in common with all other public utilities and industries, have been confronted for some time with greatly increased costs on all items of material and labor that are used in making and distributing our product and naturally, in order to properly safeguard the interests of both this company and the community we are endeavoring in every way possible to make our operations more efficient and economical, and to secure wherever proper and justifiable additional revenue for our output and service in order to offset in a manner the present abnormal and unusual high costs we are operating under which shows from our records and other information available.

"It is quite apparent that a satisfactory earning power must be shown that will not only include 'authorized' return, but also cover as stipulated in the franchise under which we operate necessary 'reserves' in order to warrant the investors in purchasing our securities."



NEWS OF THE GAS INDUSTRY



Gas Service Suspension May Result from Commission's Refusal to Grant Rate Increase

Admitting that several hundred families in the territory supplied by the Kings County Lighting Company, Brooklyn, N. Y., are not being provided with gas and asserting that the situation is growing more serious each day, Ralph Elsman, vice-president of the Kings County Lighting Company, has again informed the Public Service Commission that there is little likelihood of his company being able to continue any service during the coming winter. Mr. Elsman further asserted that the commission is fully aware of the situation, as it has recently issued an order directing that extensions to the company's plant, costing $2,500,000, be made at once. This work cannot be done under the existing conditions, Mr. Elsman stated, because, as he alleged, his company is threatened with financial disaster and is unable to raise funds from any source because of what he termed the confiscatory rate that is in effect.

"Our failure to start making these extensions at once will mean that the 250,000 people served by this company may be without gas during the coming winter," said Mr. Elsman. "This company has not been earning even its operating expenses for over two years and a half without any return on the capital investment in the form of interest on bonds or dividends on stock. Maufacturers of gas machinery are insistent that payment for any installation that they make be guaranteed before they will proceed with the work. All of these facts have repeatedly been laid before the Public Service Commission, the officials of the State of New York and the representatives of the City of New York, and they are thoroughly familiar with them, but as yet they have failed to take the remedial action necessary. It has now become a matter of hours, and I feel that I am in no position to order the installation of the machinery or raise any funds until we have been relieved from the absolutely confiscatory rate."

In support of his statements Mr. Elsman made public a leter he wrote to Lewis Nixon, Public Service Commissioner, regarding the possibility of his company complying with an order of the commission wherein certain equipment had been specified for installation before the end of the year. The U. G. I. Contracting Company, of Philadelphia, Mr. Elsman states in the letter, advised that it is impossible to have the installation of materials called for in the order completed in the time specified in the order, due to the fact that the time allowed for the installation is entirely too short.

The cost of this necessary equipment will amount, Mr. Elsman states, to approximately $840,000 in the plant alone, and asserts that, besides this, there must be expended approximately $100,000 for new mains, services and meters.

Mr. Elsman also quotes from a letter received from the vice-president of the contracting company, wherein it is declared that the lighting company, to meet the payments for the construction and betterments, must deposit at least $300,000 of the estimated cost of $840,000.

"You will readily understand that our company would not want to obligate itself to the large investment above mentioned unless you can unqualifiedly guarantee us that payments will be taken care of as they become due," is one quotation from the letter of the contracting company instanced by Mr. Elsman.

Correction

On page 518 of the June 26 issue of the JOURNAL there appeared a typographical error which has been called to our attention. It read 1 ton of anthracite coal is equaled in heating value by 239,333 cu. ft. of 600 B.t.u. gas, which should have been 1 ton of coal is equaled in heating value to 23,933 cu. ft. of 600 B.t.u. gas.

Check of Immigration Requires Labor Conservation

By FRANCIS A. KELLOR

Vice-chairman, the Inter-Racial Council

The time has passed when the American employer could count upon an unlimited supply of labor from abroad. Emigration from the countries of Europe will be strictly regulated by the Governments in the near future, and is already being directed in some of the Old World nations, which have begun to realize the value of their workers.

This is the case in Italy, for instance, which has supplied us with such vast numbers of unskilled and semi-skilled laborers. The French Government has offered Italy six tons of coal per month for each Italian miner induced to go to France, and the Commissioner of Emigration of Italy is advising his people to emigrate to France. It is asserted that opportunities are better there than in America, both for steady work and high wages.

Other countries are making efforts to keep their citizens at home. Greece is offering inducements of farms to the people, having passed an act by which large land owners may retain only one-third of their estates, while surrendering two-thirds to the peasants. If this offer should not be sufficiently persuasive, emigration from Greece may be prohibited at any time by law. Conditions in that country are being studied at present to determine what action may be necessary to prevent an undue exodus of the population. The extension of Greek territory is a powerful reason for keeping these people in their own country.

Similar conditions are found in Finland, where areas have been set aside for settlement, and farm implements and supplies are offered to small cultivators on liberal terms.

These instances show the attitude of foreign Governments toward their nationals. Instead of permitting their men and women to leave at will and select their own destinations, as

in our port, emigration will be curtailed, by many Governments to the extent deemed expedient for their own interests. Instead of the emigrant selecting his own future home, the Governments will advise him where to go, and in some cases will retain him as a citizen, with voting rights, even while living abroad. At present the Lithuanians in America have three deputies to represent them at the next meeting of the Constituent Assembly of Lithuania, while Italy has under consideration a plan to give its nationals throughout the world elective representation in its home Government.

This means that the immigrants who do come here will have less tendency to make America their permanent home and become citizens, hence we will have to make greater efforts to assimilate them than we have done in the past. It indicates a policy opposed to the best interests of America, and which should be opposed by our people before it becomes an accomplished fact.

Some of the foreign nations are planning to do the things which America should have done long ago; to protect immigrants from fraud, to establish official information bureaus, to take care of their savings through branch banks and generally to look after their welfare.

International agreements are being made between Old World countries regarding immigration. Diplomats of Hungary, Poland, Greece, Italy, France, Lithuania, Spain, Portugal and the Balkan countries have taken the lead in such conferences, but the United States, which has so much at stake in the matter, has shown indifference. If our supply of coal, iron, oil or cotton were threatened, the whole nation would be aroused, but with the imminent curtailment of our labor supply, even at this time of acute labor shortage, the Government and the business men who should be interested are remaining quite apathetic.

The new era of world-wide business requires an international view of conditions if American interests are to be adequately cared for. To help meet this need the Interracial Council has planned a series of bulletins reflecting the world movements and endeavoring to interpret them.

These are no longer mere academic questions, but matters of direct concern to the American business man. When the manifesto of a leader in Russia can react with greater force upon the workers than the words of the plant executives, or when a stream of literature in foreign languages can counteract utterances in the American press or in plant organs, it is essential to the self-interest of the American business man that he should know about these things and act with information on the facts.

Meanwhile it is to the interest of every industry to conserve the present inadequate labor supply and make the best use of it. The tendency of the foreign born workers to return to their old homes could be checked by every legitimate means. The most powerful inducement to them to remain is of course just and humane treatment, with no discrimination in wages, housing, living and working conditions between them and the native born. Efforts should be made to establish closer relations with the foreign born workers. If they have legitimate causes for discontent, the grievances should be understood and removed. The same spirit of co-operation that is being secured through enlightened employers and their English-speaking workers should be developed into relation to the foreign born laborers.

This is not "coddling," not philanthropy, but labor conservation. As in the early days of America we were wasteful of our resources, coal and oil, natural gas and timber, until we saw the results of extravagance so at present we are as wasteful of our man power, as if the supply were inexhaustible.

We should not be deceived by the temporary increase in immigration. The figures that indicate a large number of arrivals at Ellis Island fail to show the fact that the proportion of women, children, professional and clerical workers is so great as to afford little relief to our labor shortage. Of the manual laborers coming in, a large percentage are men who went abroad to fight and are now returning to their old jobs. Of new workers, to do the essential work of America, there is an exceedingly small percentage, while recent correspondence from all parts of the United States indicates serious shortage of labor in almost every section.

The course of action for the employer is therefore first to conserve labor as carefully as he conserves his raw material; second, to regard immigration problems with the same interest that he gives to international commerce, realizing that America is no longer isolated and that what happens in the Old World to-day will be reflected in his own business to-morrow.

An international conference on immigration is planned for 1921, in which the United States should play a leading part. Business men who are interested may obtain further details through the Inter-racial Council, Woolworth Building, New York City.

Dallas Gas Controversy

Natural gas conditions in the city of Dallas, Tex., are just about as far from a real settlement as they were early in the year, and if some understanding is not made, there will no doubt be a shortage for that city during the coming winter season. Whether the natural gas apportioned to Dallas should be on the basis of population or upon the number of meters in Dallas in comparison to other cities supplied by the lines of the Lone Star Gas Company is the stumbling block that is delaying an agreement between the two companies and preventing the Dallas Gas Company from submitting the long-expected proposal to the city of Dallas, according to statements issued by officials of the two companies.

The Dallas Gas Company contends that the apportionment of gas and the number of supply lines to Dallas should be based upon the number of consumers served, according to the books of the Dallas and Fort Worth companies, while the Lone Star Gas Company contends that the apportionment should be made on the population of the various cities served by its lines, as is provided in the present contract and new contracts made by distributing companies in other cities.

The attitude of the city officials is that they can take no action until a new proposal is made by the Dallas Gas Company, according to a statement issued by Mayor Wozencraft some time ago. All negotiations between the city of Dallas and the gas companies were broken off following months of deliberation the first part of June, and since that time no new proposal has been made by either side.

The new proposal to be made to the city of Dallas when the question of apportionment is settled will be upon the same basis as has been accepted by other cities served by the Lone Star Gas Company, naming a rate of 67½ cents net per 1,000 cu. ft. to the consumer.

The following statement was issued by Henry C. Morris, vice-president and general manager of the Dallas Gas Company:

"We have been negotiating with the Lone Star Gas Company with reference to matter of a gas supply, but no agreement, either tentative or otherwise, has been reached, since there are several important matters of difference not yet agreed upon. These matters of differences are ones that will concern not merely the Dallas Gas Company, but the consumers of Dallas as well, and are of such importance that this company considers that it and its consumers should be fully protected. Any early outcome from the negotiations will depend upon what final proposition we will be able to secure from the Lone Star Gas Company. One of the matters of contention is the Lone Star Gas Company's existing arrangement for field line connection which will work against an equitable supply for Dallas. The Lone Star Gas Company contends that the supply lines as between Dallas and Fort Worth should be arrived at by comparison of population of the two cities, as shown by the 1920 census, when officially announced, whereas we believe that it is the number of consumers served that creates the demand for gas, and not the general population of a community. Therefore, supply lines should be provided on a basis of the number of customers served by the respective cities. By using either method of ascertainment of necessary feed lines Dallas is short in feed lines in comparison with Fort Worth.

"We are, of course, anxious that these differences in which the citizens of Dallas are also equally interested be adjusted satisfactorily before a contract is submitted to the Board of Commissioners."

Fred M. Liege, vice-president and general manager of the Lone Star Gas Company, explained the stand taken by his company in the following statement:

"Several months ago the Lone Star Gas Company, after weeks of negotiations, agreed to accept a proposition suggested by the mayor of the city of Dallas and Judge Etheridge, which failed to receive the approval of the Board of Commissioners, the same proposition having been, at the same time, offered to all other cities and towns along the lines of the Lone Star Gas Company. After the rejection of all proposals at Dallas, the various distributing companies along the lines of the Lone Star Gas Company, who comprise approximately 75 per cent of the population indirectly served by the Lone Star Gas Company, submitted to the various cities and towns contracts providing for the same rates to become effective upon the same conditions as the proposition originally recommended by the mayor of the city of Dallas and Judge Etheridge.

"The Lone Star Gas Company immediately advised the Dallas Gas Company that it would make the Joshua Junction connection immediately upon the city of Dallas passing an ordinance covering the rate for the three-year period, as provided for in all of the other cities without a new contract, or would enter into a new contract that would not conflict with the contract of the other distributing companies based upon a new ordinance as indicated above. The Lone Star Gas Company sells gas to several distributing companies, which in turn distribute gas in thirty-odd towns and cities. Contracts with all of the distributing companies provide for the gas to be equitably distributed in proportion to the population of the cities served by the respective distributing companies.

"The Lone Star Gas Company could not attempt to proportion gas on the basis of the number of meters installed in any city or town, due to the fact that the distributing companies have various ways of handling their customers. Some companies seal their meters and leave them installed in the various houses, whether vacant or occupied, while other companies move the meters immediately on the house being vacated. Furthermore, some companies measure through one meter all of the gas furnished to large buildings in which there may be several hundred tenants, whereas other companies have a meter for each tenant. For this reason the division of gas has always been on the basis of the population of the various cities served by the distributing companies on the system of the Lone Star Gas Company, and it has been our experience that the consumption per capita in the various cities of North Central Texas is practically the same.

"The Lone Star Gas Company would regret any condition which would make it impossible for it to supply the Dallas Gas Company from the new source of supply made available by the increased rate, but it will be impossible for equitable distribution of the gas at the same rate and the same terms and conditions as have been made with the other distributing companies under ordinances passed by the other cities and towns on its pipeline system."

Program of Sessions of the National Chemical Exposition

The sixth National Exposition of Chemical Industries will be held in Grand Central Palace, New York City, Sept. 20 to Sept. 25, inclusive. The program that has been arranged is in keeping with the progress of the industry, which is evidenced by more than 400 different exhibits securing space this year. This is a new record, the best previous record in this respect being in Chicago last year when 358 separate exhibits were listed.

The program calls for four symposiums and the speakers are among the best known in the industrial and chemical engineering worlds. One symposium will be on fuel economy, the second on industrial management and materials handling, the third on chemical engineering and the fourth on ceramics. Motion pictures also will greatly aid in placing the importance of the chemical industry before the public.

Dr. Charles H. Herty, the chairman of the advisory committee of the exposition, will open the display at 8 o'clock on the evening of Monday, Sept. 20. Charles L. Reese, who will talk on "Co-operation in the Industries," and other speakers will follow. The motion picture program for the opening night includes two subjects, "The U. S. Ammonium Nitrate Plant No. 2 at Muscle Shoals," by courtesy of Dwight P. Robinson & Co., and "Modern Packaging Methods," by courtesy of the Pneumatic Scale Corporation.

Beginning Tuesday afternoon and evening sessions will be held in order to carry out the big program. The Tuesday schedule follows:

2 P. M. Fuel Economy Symposium:

Chairman's Address by R. C. Beadle, managing editor, *Combustion*.

"Burning Coal at 100 Per Cent B.T.U. Efficiency"—W. O. Renkin, Quigley Furnace Specialties Company.

"Fluid Heat Transmission"—Alexander B. McKechnie, Parks-Cramer Company.

"Saving Fuel by Controlling Chimney Losses"—F. F. Uehling, Ueh-

ling Industrial Corporation.

"Producer Gas and Modern Mechanical Producer"—W. B. Chapman, Quigley Furnace Specialties Company.

"Refractory Cement Life Insurance for a Furnace"—F. W. Reisman, Quigley Furnace Specialties Company.

"Preventing Conduction and Radiation Heat Waste"—S. L. Barnes, Armstrong Cork Company.

"The Reason for the Fuel Saving in the Dressler Kiln"—Conrad Dressler, American Tunnel Kilns Company.

Evening 8 P. M.—Motion pictures: Great U. S. Chemical Industries.

"The Story of Sulphuric Acid." Courtesy General Chemical Company.

"The Production of Salt for the Chemical Industry." Courtesy International Salt Company.

"Perfumes for the World." Courtesy Antoine Chiris Company.

"A New Chemical Industry: Leather from the Ocean—Fish Leather." Courtesy Ocean Leather Company, and Ford Film Company.

"The Manufacture of Soap." Courtesy Bureau of Commercial Economics.

WEDNESDAY

2 P. M.—Industrial Management Symposium and Material Handling Symposium.

"Ultra Analysis of Costs"—Harrington Emerson, the Emerson Engineers.

"Research in Industrial Conservation"—H. E. Howe, chairman, Division of Research Extension, National Research Council.

"Progress of the American Coal Tar Industry"—Grinnell Jones, U. S. Tariff Commission.

"Chain Power Transmission"—F. G. Anderson, Morse Chain Company.

"Steel Collapsible Shipping Containers as Related to the Chemical Industries"—Everett W. Morgan, Pneumatic Scale Corporation.

8 P. M.—Motion pictures: Great U. S. Chemical Industries.

"Modern Coke and Gas Manufacture." Courtesy The Koppers Company.

"Colloidal Movement in Asphalt." Courtesy Barber Asphalt Paving Company.

"The Story of Petroleum Oil." Courtesy Standard Oil Company of New Jersey.

"The Asphalt Paving Industry." Courtesy Barber Asphalt Paving Company.

THURSDAY

2 P. M. Chemical Engineering Symposium.

Meeting of American Institute of Chemical Engineers. David Wesson, chairman.

"A New Method of Destructive Distillation"—Thomas W. Pritchard, Fuel Products Corporation.

"Nitration of Hydrocarbons"—A. Hough and W. Savage.

"Recoverance: A Physical Property in Material and its Importance"—Robert G. Guthrie, Widney Test Laboratories.

"Operating Data of a Modern By-Product Coke Oven Plant"—C. R. Bellamy.

"Canada and the Chemist"—C. Price-Green, Canadian National Railways.

"Utilization of Peat," illustrated—B. F. Haanel, Canada Department of Mines.

"Corporation of Iron and Steel as Affecting the Industries"—W. D. Richardson, Swift & Company.

6.30 P. M.—Dinner, American Institute of Chemical Engineers at the Technology Club.

8 P. M.—Motion pictures: Mining Industries.

"The Story of Coal." Courtesy Sullivan Machinery Company, and U. S. Bureau of Mines.

"Building, Mining and Quarrying Machinery." Courtesy Sullivan Machinery Company.

"Producing Pumps and Engines." Courtesy Midwest Engine Company.

"The Manufacture of Asbestos." Courtesy Bureau of Commercial Economics.

FRIDAY

2 P. M.—Ceramic Symposium.

Meeting of American Ceramic Society.

"A Classification of Sheet Steel Enamels"—R. R. Danielson, Bureau of Standards, U. S. Government, and other papers by men well known in the ceramic industry.

8 P. M.—Motion pictures.

"Silver Mining in Ontario."

"Gold Mining in Ontario." Both courtesy Ontario Department of Mines.

"Foamite Firefoam Extinguishing Apparatus at Work." Courtesy Foamite Firefoam Company.

"Continuous Motion, Conveying, Stacking, Elevating, Loading and Unloading Machinery." Courtesy Brown Portable Conveying Machinery Company.

"The U. S. Ammonium Nitrate Plant No. 2 at Muscle Shoals, Ala." Courtesy Westinghouse-Church Kerr, Inc.

"Modern Packaging Methods." Courtesy Pneumatic Scale Company.

"The Manufacture of Pottery." Courtesy American Ceramic Society.

There is an unusual interest in the chemical show this year because of the position that has been attained by American chemists in the past five years. It is expected that experts from Europe and South America will attend. It is cetain that Canada will be well represented. Sir George Foster, Minister of Trade and Commerce of Canada, has sent word that unless something unforeseen happens he will be among the visitors.

New Orleans Gas Light Co. Making Extensive Improvements

The New Orleans (La.) Gas Light Company has awarded a contract to the Western Gas Construction Company for the erection of three new steel purifiers 36x36x12, one P. & A. extractor and washer at a cost of about $100,000. Also two 11-ft. water-gas sets will be remodeled. This work will include two new generators, 42-in. angle valve connections, larger connections between superheater and carbureter, stack valves, and outlet connections for the new wash boxes which will be installed in connection with remodeling of these sets.

Both units will be equipped with hydraulic operation and Western Gas hot valve at a cost of approximately $35,000.

A new cup and grip sheet will be installed on the 100,000 cu. ft. holder at the Algiers plant at a cost of about $5,000.

A medium high-pressure line is being installed to reinforce the outlying sections of New Orleans. This line is taken direct from the plant. It is proposed to distribute gas at about 6 lb. pressure during the peak load. On the off-peak load gas will be distributed at holder pressure, as this line is connected direct to the 5,000,000 cu. ft. storage holder. This line is being installed at a cost of about $65,-

000, which includes installation of two regulator stations. All this work will be completed about Nov. 15, this year.

Service Charge Explained

In 1918 a service charge or customer's charge was put into effect by the Northern Connecticut Light & Power Company, Thompsonville, Conn., and a pamphlet explaining it was sent to every customer but to further enlighten those to whom it may not be clear Walter P. Schevale, general manager of the company, gives the following explantion:

The costs for gas supplied are made up fundamentally of two items:

First: Charges derived from cost not dependent on the quantity of gas actually consumed, such as interest, depreciation, taxes on investment in distribution mains, governors, service connections, meter equipment, a part of general office and administration expense, also commercial expense consisting of reading meters, billing, collecting, and other items covering the cost of carrying a customer on our books.

Second: Charges derived from costs that are dependent on the actual quantity of gas consumed. Delivered cost of gas, either manufactured or purchased.

Our service charge covers only a part of the fixed charges and is made up of 6 per cent interest and 2 per cent depreciation on the cost of the company's property devoted to the individual consumer, and located almost entirely on his premises, amounting to $3.20 per year per customer, and the commercial expense per customer, which based on 2,544 customers costs $3.10 per year per customer. This makes a total cost of $6.30 per year for each customer connected and remains the same whether any gas is used or not. To cover these costs a service charge of $6.00 per year or 50 cents per month has been embodied in the rate.

It should be plain that if each customer is charged with these costs it enables the company to have a lower rate per 1,000 cu. ft. for gas used and enables the consumer to use any quantity of gas desired without having to pay for the unprofitable customer as the amount of the service charge is eliminated from the rate for gas. In our case we would have been obliged to increase the rate for gas 45 cents per 1,000 cu. ft. instead of 25 cents if we had not added 25 cents to the service charge.

The service charge rate is now in use in at least 40 States in the Union and has been passed on by eighteen utility commissions as the most equitable method of charge, no commission ever having decided against it.

It is of interest to know that the consumer's charge or service charge schedule has been generally regarded with misgivings and even with hostility when first introduced. Very brief experience with it, however, has invariably changed the attitude of its most earnest opponents when they have seen that it offers a possibility for actually lower rates than the flat schedule.

Stamford Co. Laying New High-Pressure Gas Main

A new high-pressure gas main to Glenbrook, Conn., which is expected to remedy the lack of pressure complained of by residents of Glenbrook and Springdale for the past year, is now half completed by the Stamford (Conn.) Gas & Electric Company, which expects to see the new main in operation by Oct. 1.

The new main consists of about three and one-half miles of 6-in. pipe, capable of withstanding a pressure of 50 lb. to the square foot, which will be reduced by district governors when it reaches the feed mains of Glenbrook and Springdale to the required pressure for household use. The improvement will also have a beneficial effect on gas service in the entire eastern and northern parts of the town.

Work on the new main, which will cost between $50,000 and $60,000 when completed, was started in May, and about half the street work is now completed.

It was hoped to commence the work in March of this year, but the company's inability to secure pipe forced the postponement of the start of the work until May. The pipe used is 6-in. cast-iron "Universal pipe," with machined joints which are bolted together. This pipe has never been used in Stamford, outside of the company's South End plant, until this main was laid. It is said to be the last word in gas main pipe. The pipe costs more than four times the amount which would have to have been paid only a few years ago.

The new main is built to withstand a working pressure of 50 lb. to the square inch, but 10 lb. will provide a pressure at the Glenbrook outlets ample for the needs of the community at present. As the consumption of gas increases at these points the pressure will be increased so that a sufficient volume of gas may be delivered.

The new compressor to be established in the South End plant of the company is operated by a motor of 170 hp. It is known as a duplex gas compressor and has two cylinders each of 15 in. diameter. The stroke is 14 in.

The old mains to Glenbrook were constructed about twenty-five years ago and at that time were deemed large enough to supply the community for all time. The extension to Springdale was put through about seven year ago.

President of Pacific G. & E. Resigns

Frank G. Drum, president of the Pacific Gas & Electric Company, San Francisco, Cal., has resigned after fifteen years of service. He will remain as director and member of the executive committee.

Mr. Drum is succeeded by Wiggington E. Creed, attorney and president of the Hooper Lumber Company and other large interest, and selected, it is understood, by Mr. Drum himself as his successor. George K. Weeks retires from the board of directors to make place for Mr. Creed.

The change in the executive head is due, Mr. Drum announced, to a need for more time to give to other interests.

Gas Workers Get Wage Increase

Manager John J. Kirkpatrick of the Gas and Electric Department, City of Holyoke, Mass., has announced an increase of 35 cents a day to retort men and gas makers of the department. These men are listed as high-class laborers and will henceforth receive $5.50 a day, or $33 a week. The old pay was $5.15 a day, or $30.90 a week.

The employees of the gas works petitioned Manager Kirkpatrick some time ago for an increase in wages and were informed at that time that the matter would be carefully considered.

Pacific G. & E. Granted 10 Per Cent Rate Increase

The California Railroad Commission has granted Pacific Gas & Electric Company permission to advance gas rates in central and northern California on an average of 10 per cent.

An advance in electric rates was given two weeks ago. The new rates are effective July 24 and add from 5 to 15 cents per 1,000 cu. ft. to present gas prices.

The new rates are in addition to the former 10-cent surcharge authorized in June, 1918, and are designed to cover the advance in costs of manufacture and distribution since that time. In the cities of Sacramento and Vallejo no increase has been allowed, the commission contending that the additional costs of operations have been absorbed by heavy increase in volume of business in these communities.

The commission has authorized a reduction in the heating qualities of the gas sold in the east bay communities from 570 to 550 British thermal units, inasmuch as the large generators in Oakland can be more economically operated when producing the lower grade. The change in rate of gas furnished offsets part of the increased operating costs and the new rates just established in the east bay cities are now the same as those in San Francisco. San Francisco rate is now $1.05 per 1,000, against 95 cents, and Oakland is now $1.05 against $1 previously. The maximum advances of 15 cents were made in the smaller communities.

Gas Company to Repair Mains

Extensive repairs are to be made to the gas mains in Leavenworth, Kan., and considerable along this line already has been accomplished, according to W. H. Frost, manager of the local company. The mains have been in bad condition for some time and the leakage of gas has been a heavy drain on the company. Mr. Frost has just recently returned from New York where he was granted permission to go ahead with the work.

Although the local company is not being backed very strongly by the parent company in New York, Mr. Frost says he will use every available cent for the improvement of the system.

There are 84,080 ft. of gas pipe in use at present in Leavenworth and the greater part of it needs attention. It is estimated that the cost of improvements to be made within the next two years is $330,888.60. It is hardly probable that this much work will be done as it is doubtful that this amount can be raised, owing to the hard times that the gas company is undergoing at present. Many parts of the city are now waiting for improvement on their mains and as labor is so scarce it is all the company can do to repair a little at a time.

Gas leakage is found by boring a hole through the pavement at the joints of the pipe which are twelve ft. apart and registering the amount of gas that is escaping. The amount that escapes tells how far the leak is from the joint. The earth is always of a greenish hue also.

Illinois Utility Rates Advance

The Illinois Public Utilities Commission has advanced gas, electric, water, and traction rates, in 147 cities and towns in northern Illinois, including practically every Chicago suburb. Gas rates in Oak Park, Evanston, and all immediate suburban points are increased from 95 cents to $1.35 per 1,000 cu. ft.; and in Streeter, Kankakee, Morris, Ottawa, Pontiac, Seneca, Marseilles, from $1.10 to $1.45. Electric lighting rate is increased 10 per cent, and electric power 20 per cent. Water rates go up 25 per cent.

Wakefield Contracts for Auxiliary Supply of Gas

The Wakefield, Mass., municipal light plant has made arrangements for an auxiliary supply from the Malden & Melrose Company to prevent large sections of the town from being without gas. The commissioners claim that oil of inferior quqality is responsible for the frequent stoppage of the water-gas machinery in the Wakefield plant. The commission has requested additional equipment, but thus far the town has refused it, anticipating to some extent abandoning municipal operation.

Many Improvements in Gas Service of Maine Company

Greatly improved gas service in Waterville and Fairfield, Me., has resulted from the Central Maine Power Company's recent additions to its gas making and distributing equipment at the Waterville plant.

The old Waterville gas plant was completed in 1915 and the distribution of gas was through 6-in. mains. Inside of two years the output of the plant exceeded the capacity of these mains, and as a result the customers nearest the plant were getting gas at higher pressure than they should and those farther out lower pressure than standard.

To offset these conditions and render proper gas pressure service, the company, as soon as was possible after taking over the plant, completely renovated the gas plant and distribution system. An Ingersoll-Rand compressor and six high-pressure gas tanks with a total capacity of 60,000 cu. ft., were installed, backed up by a new Tenney-Lowe water-gas manufacturing plant with 30,000 cu. ft. capacity per hour—an increase of 23,000 cu. ft. per hour over the old gas plant.

Gas is fed from the six high-pressure tanks into a governor which reduces the pressure, then through a second governor which reduces it still more, and finally a sensitive governor is in operation on each meter to insure that the gas pressure on each customer's service would be reduced to the proper pressure.

This system is now in complete operation under the expert supervision of the manufacturers and is working out splendidly. The point of minimum economy in operation has not yet been reached, but in a short time the experts will have worked this out also.

A new coal shed with a capacity of 1,000 tons has also been constructed and is being filled up as rapidly as possible.

In spite of the difficulties of securing materials and workmen, the company has put through its reconstruction program on the old Waterville gas plant almost within a year.

National Balloon Races to Start from Chicago

Notification has reached Indianapolis that because of the refusal of J. Dorsey Forrest, general manager of the Citizens Gas Company, to provide gas for the expansion of the racing balloons the start of the national and international balloon races from the Indianapolis Motor Speedway has been changed to Chicago, Ill., by the officials of the Aero Club of America. The races were scheduled to start from Indianapolis Sept. 11 and Oct. 23. They now are to be held in Chicago on the same dates, according to the announcement received from New York officials.